CLAIMS

I claim:

1. A disinfection flow cell assembly for disinfection of water including wastewater and/or potable water wherein the water passes through a flow line at a rate in the range of 10 gallons per minute to 70,000 gallons per minute comprising spaced electrodes as wide as 8 feet in distance constructed to form a part of said flow line with the water passing therethrough, said electrodes having contact surfaces formed of material selected from a group consisting of stainless steel, iron, iron alloy product and copper, a power supply connection to said electrodes and operable to create an ionic current flow between said electrodes and operable to create a current density for disinfection of the water or wastewater at flow rates on the order of 10-70,000 gallons per minute, said power supply connection establishing voltages in the range of 1-200 volts and current densities in the range of 0.2-50.0 ma/cm^2.

2. The disinfection flow cell assembly of claim 1 wherein said electrodes include an electrode surface establishing a contact time related to a current density and water flow rate operable to produce disinfection at least to the level of 2-$\log_{10}$ (99.0%).

3. The disinfection flow cell of claim 1 wherein said water contains oxygen and said ionic current flow generates hydrogen peroxide ($2\ H_2O+2e+O_2 \rightarrow H_2O_2+OH^-$) in said water.

4. The disinfection flow cell of claim 1 with stainless steel, iron or iron based electrodes including an ultrasonic source coupled to said electrodes, and wherein hydroxyl radicals (•OH) are generated in accordance with:

$$H_2O_2+Fe^{2+} \rightarrow Fe^{3+} + \bullet OH + OH^-$$

5. The disinfection flow cell assembly of claim 1 wherein said electrodes includes a pair of opposed extended sheet electrodes mounted in aligned spaced relation to define spaced walls of a pipe or open channel section with said water flowing between said electrodes wherein the distance may vary from less than 1 inch to as long as 8 feet.

6. The disinfection flow cell assembly of claim 3 wherein said electrodes have areas related to the maximum flow rate of said water to establish a select minimum contact time of the flowing water and the electrodes.

7. The disinfection flow cell assembly of claim 1, 3 or 4 wherein the said electrodes generate hydrogen peroxide and hydroxyl radicals.

8. The disinfection flow cell assembly of claim 1 wherein the electrodes are made of copper with the flow cell of length in accordance with a specified ionic copper concentration to maintain the copper ion concentration in the effluent within predetermined regulatory limits.

9. The disinfection flow cell assembly of claim 1 wherein said power supply is a switched bipolar DC power supply.

10. The disinfection flow cell assembly of claim 1 wherein said DC power supply is provided with means to periodically reverse the polarity across said cell.

11. The disinfection flow cell assembly of claim 1 or 4 including a low frequency ultrasonic transducer unit coupled to said electrodes to sonicate said electrodes and water electrolyte.

12. The disinfection flow cell assembly of claim 11 wherein said ultrasonic transducer operates within the range of 15 kH_2 to 50 kH_2.

13. The disinfection flow cell assembly of claim 11 wherein said low frequency transducer is an ultrasonic piezoelectric converter coupled to said electrodes.

14. The disinfection flow cell assembly of claim 1 including a fluorometric monitor to detect and quantify the total microbial population density of said water.

15. The disinfection flow cell assembly of claim 14 wherein said power supply has an input control to adjust the power output level and where said fluormetric monitor is connected to said input control of the power supply controller to adjust and minimize electric power consumption.

16. The disinfection flow cell assembly of claim 1 including a fluorometric spectrometer to monitor and quantify the total microbial population density of said flowing water.

17. The disinfection flow cell assembly of claim 1 wherein said electrodes conform to the shape of the flow line and constitute a part of outer walls of said flow live with said water flowing through the flow cell engaging and filling the space between said electrodes.

18. The disinfection flow cell assembly of claim 1 wherein said electrodes have length in the flow direction based on the flow rate of the water and the conductivity of said water.

19. The disinfection flow cell assembly of claim 1 wherein said a power supply establishes a potential at the electrodes establishing a current density in the water sufficient to reduce the microbial population to a specified level including at least 200 cells/100 ml in wastewater and at least 1 cell/100 ml in drinking water using 2-log (99.0%), 3-log (99.9%) or 4-log (99.9%) inactivation as required.

20. The disinfection flow cell assembly of claim 18 wherein said water is treated at a rate as high as 100 million gallons per day in pipe diameters or channel widths as large as 8 feet.

21. The disinfection flow cell assembly of claim 1 wherein said electrodes are formed of copper and of substantial length and establishing an extended contact time to said power supply being selected to establish a lower current density and thereby a low copper concentration in the effluent within regulatory limits.

22. The disinfection flow cell assembly of claim 20 including monitoring means to monitor the level of copper concentration in said water passed through the electrodes.

23. A method for electronically disinfecting water including potable water and wastewater, comprising passing said water through a passageway having opposed electrodes of stainless steel, iron, or iron based metal forming opposed outer wall of said passageway, supplying a DC voltage in the range of 1 to 200 volts across said electrodes and establishing current flow between the electrodes with a current density in the range of 0.2 to 50.0 milliamperes/cm^2 through the water passing through said electrodes, said current being established in a range of 1 milliamperes to 10

amperes and creating ions of the material of said electrodes and operable for removal of *E. coli* and other pathogens from said water.

24. The method of claim 23 including establish a water flow rate on the order of 10-70,000 gallons per minute.